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ECONOMICS AND BUSINESS BULLETIN OF THE SCHOOL OF BUSINESS AND PUBLIC ADMINISTRATION

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A Study of the Social Impact of Television on Philadelphia Families

by MYRON S. HEIDINGSFIELD*

THE effect of television on the leisure time activities of the family unit has been a prime topic of conversation in recent months. Many of the discussants have surmised that once television ownership became as common as that of radio, the already limited amount of recreation time of individuals or families would be further reduced. It also has been thought that some significant changes might be found in attendance at commercialized forms of recreation such as plays, movies, and sporting events.

PROBLEM AND METHOD

The Marketing Research class of the Temple University School of Business and Public Administration, in view of the questions raised, thought it might be of value to seek information concerning the actual effects of television on family life.[1] A project of research was then framed about the central problem, a study of the social impact of television on Philadelphia families. Its objectives were stated as follows: (1) to reveal any changes in the pattern of family recreation programs; (2) the effect that television set ownership had on the personal relationships among and between members of the family; (3) the effects, if any, on the relationships of the family unit with friends and neighbors; (4) the program preferences and reactions to commercials; and (5) the kind and age of equipment now in use.

Although several lists of television set owners for the Philadelphia area were known to be in existence, it was impossible to obtain one. Therefore, it was necessary to design a sample which would give a proper cross-section of Philadelphia families who owned television sets.

In order to equate the multiple social and economic characteristics which typify the Philadelphia community, it was decided to stratify the city area into its several major geographic divisions. Of the more than 17,000 blocks in Philadelphia, it was possible to compute the exact proportion of blocks within each area to the total. It was assumed that population concentration and the social and economic characteristics were directly a function of geographic stratification.

It was then decided to use a sample of fifty blocks which were chosen at random, but in the proportion that specific geographic areas had to the whole. It must be emphasized that no judgment or purposeful selection of blocks was permitted, because, in accordance with the scientific definition of random, each block in the total number for any given geographic division had an equal chance of being selected.

Once the blocks were scientifically selected, every dwelling unit on the block was screened for the possession of a television set. This eliminated the possible biases which might have arisen from choosing those homes where the only sign of television ownership was an outside aerial. In using this method, those sets with indoor aerials were revealed, and, in some cases, more than one unit was found in a home.

Following this, the names and addresses of the people who owned television sets were collected. A mimeographed letter, on university letterhead, was then sent out to inform the persons selected that they had been chosen as part of a cross-sectional sample, and inviting them to cooperate with the two interviewers who would visit them subse-

[1]It should be made clear at the outset that, although the class carried out the detailed work of the program, the writer, who was the director of the project, assumes all responsibility for interpretation of the data collected.

*Myron S. Heidingsfield is the Professor of Marketing in the Temple University School of Business and Public Administration. He is co-author of the text, **Market and Marketing Analysis**, Henry Holt and Company, 1947, and Executive Vice President of the marketing research firm of A. B. Blankenship and Associates, Inc.

quently. This was done both to allay any suspicions the proposed respondents might have and to insure entrance into their homes during the hours from 7 to 10 p. m. These hours were chosen as it was felt that, in order to get as complete a picture as possible, at least two adult members of the family should be interviewed **simultaneously**. In a majority of cases these were, of course, husband and wife. However, there were some families which had only one adult member and others in which there were two men, two women, a brother and a sister, or other combination. In order to maintain the representativeness of this sample, all family units, no matter what the sex or number of adult members, were accepted.

One of the results of this strict adherence to sample procedure was a final imbalance between the number of males and females. The total number of families in the sample was 226, comprising 188 males and 209 females.

It has often been said that a marketing research job is no better than the character of its interviewing. In order to obtain the best possible results with students, it was important that the questionnaire be of the highest possible quality.

The construction of the questionnaire followed three very definite steps. At the outset, the class, in consultation with the writer, outlined the areas within which information would be sought. This subject material then was used as a basis for some thirty conversational interviews with television set owners, the results of which were recorded verbatim.[2] At a subsequent meeting of the class, the results of this "conversational interviewing" were analyzed. A preliminary questionnaire was designed thereafter on the basis of these findings.

With the "pretest questionnaire," the students again interviewed an additional small sample. In this case, however, they adhered strictly to the questionnaire and not only recorded the answers to each question, but also indicated which questions were ambiguous, which might be deleted and any other appropriate modifications.

A careful analysis of the pretest results was used as the basis for the design of the final questionnaire which was employed in the study.

IMPACT OF TELEVISION

The data seem to indicate that the introduction of a television set into the home resulted in a marked change in leisure time activities of the adult members of the family.

Leisure Time Activities

It was found that, prior to ownership of a television set, the women had devoted an average of some eighteen hours a week to the pursuit of leisure time activities. The male members of the

[2]The students were instructed to discuss informally leisure time activities, programs, and so on with the chosen respondents and to record all of the discussion in verbatim form.

TABLE I

Per Cent and Amount of Leisure Time per week Devoted to Various Recreational Activities by Females Before and After Installation of a Television Set

	Before TV % Participating[1]	After TV % Participating[1]	Before TV Average Hours[2]	After TV Average Hours[2]
Movies	47.8	14.8	3.6	2.5
Radio	46.4	13.4	18.2	11.2
Reading	28.2	20.6	11.2	9.8
Sewing, knitting	24.4	16.3	9.0	8.4
Social activities	20.1	14.4	5.9	5.1
Miscellaneous	23.9	32.5	5.8	5.3
Television	...	65.6	...	18.9

[1] Percentages will not total 100 per cent because of multiple answers.
[2] "Average hours" refers **only** to the percentage reporting such activity.

TABLE II

Per Cent and Amount of Leisure Time Per Week Devoted to Various Recreational Activities by Males, Before and After Installation of a Television Set

	Before TV % Participating[1]	After TV % Participating[1]	Before TV Average Hours[2]	After TV Average Hours[2]
Radio	53.2	11.2	13.3	6.7
Movies	36.7	14.8	4.0	3.2
Reading	30.9	30.8	10.9	8.4
Social activities	20.2	14.3	8.4	7.3
Work around the home	10.1	20.2	10.9	10.8
Miscellaneous	53.7	57.9	7.3	6.6
Television	...	76.6	...	15.6

[1] Percentages will not total 100 per cent because of multiple answers.
[2] "Average hours" refers only to the percentage reporting such activity.

household indicated that they had devoted approximately nineteen hours a week to recreation. Once the television set had been installed, no radical change took place in the number of hours devoted to leisure time activities. However, the number of hours devoted to recreational activities by females was increased to a fraction more than twenty per week on the average, that for men to twenty-three.

It is doubtful whether one could say that the introduction of television into the home was responsible for the increase in the average number of hours spent in some form of recreation pursuit. It seems that the more important factors are found in the changes in time spent in participation in various types of activities. (See Tables I and II.)

Perhaps the most obvious conclusion that can be formulated as a result of a study of these two tables is that prior to the installation of television more women went to the movies than men, while a greater number of men listened to the radio.

The most striking change in leisure time activity has been the lessening of movie attendance and radio listenership for all adults. Among the females, notable decreases are also reported in the time spent in reading, in sewing, and in social life, while the miscellaneous activities have increased. On the other hand, the men do not report a decrease in reading but twice as many men indicate that they worked around their homes after the installation of the television set.[3]

A comparison between the average number of hours spent in any one activity before and subsequent to television set ownership reveals only a moderate decline in all cases except radio listenership. This is contrary to the marked decline found in the percentage of those participating in any one activity after television. When questioned about the reason for the change in activity participation and in the average number of hours spent both in one and in all recreational pursuits, almost all of the respondents gave the advent of television in their homes as the cause.

Changes in Activities

It was assumed by the class that the television audience may have been introduced to new and different forms of entertainment. This thought prompted the question, "Since you have had a television set, do you have any new activities?" Eighty-five and six-tenths (85.6) per cent of the men answered with a resounding "No." The women were only a little less decisive, 81.3 per cent responding negatively. Of the small proportion who acknowledged new activities, 7 per

[3] Some claim to greater literacy might also be made by the males because a somewhat larger percentage spend part of their leisure time reading. No comment can be made on the type of the material being read, however.

cent of the families said that they entertained more and some 5.3 per cent indicated a greater interest in sports. The other new activities were in such small numbers that no attempt was made to tabulate the percentages. There was no evidence that any desire was stimulated to attend or participate in activities similar to those televised.

The gradual disintegration of the American family as a self-contained unit has long been cited by many social scientists. This trend seems to be an offshoot of the great industrial progress characteristic of our economy. Tasks about the home have been lightened so much, and there are so many diverse calls outside the home for all of its members that the family, as a self-sufficient unit capable of attending to any and all its wants, no longer exists. Children, instead of remaining under parental control and tutelage, are sent to school at a very early age and such responsibility is transferred to the teacher. The gentle arts of conversation and self-amusement, so typical of early American life, have all but disappeared. In their stead are found movies, baseball games, and other social activities, all of which take place away from the home. Those who remain at home rely upon the radio for a large part of their amusement. It is difficult to predict just what television will do either to remedy or to worsen this situation. This study, however, does indicate that the number of evenings which any one of the adult members of the family spends away from home was reduced after the installation of a television set.

When the men were questioned as to how many nights a week they spent at home, the average was approximately five nights before and six nights after the installation of television. The averages were the same for the women. (See Table III.)

The evidence revealed in Table III shows a marked swing toward an increase in the number of evenings spent at home once television became a medium of amusement for the family. For example, prior to set ownership the greatest percentage of men remained at home four nights while afterwards the greatest percentage of men remained at home seven nights per week. Among the women, the greatest percentage remained home five nights a week before and seven nights a week after the installation of television.

When the respondents were questioned as to their reason for the change in the number of evenings spent at home, almost 50 per cent listed television ownership. However, it must be reported that the addition of children to the family was given as the next most important single cause for remaining at home during the evening.

If the conclusions reached here still seem to be true after additional study on regional and national scales, then it would

TABLE III

The Number of Evenings Per Week Spent at Home Before and After the Installation of Television

No. of Evenings Spent at Home	% Males Before TV		% Males After TV		% Females Before TV		% Females After TV	
1	0.6		1.9		1.0		...	
2	6.2		1.9		4.8		0.5	
3	14.0		7.5		14.9		3.9	
4	23.6		7.5		15.4		4.4	
5	20.2		23.6		24.1		16.8	
6	12.8	29.4	23.6	56.5	20.7	39.0	31.0	73.3
7	16.6		33.9		18.3		42.3	
None	2.8		...		...		...	
Don't know	3.4		0.6		0.5		...	

TABLE IV

General and Specific Effects of Television Set Ownership on Personal Relationships with Friends and Neighbors

	Total	Male	Female
General			
No	62.4	61.7	63.0
Yes	37.2	37.8	36.5
Specific			
More visits from neighbors	10.5	9.0	11.9
Better relations	8.3	7.4	9.0
Visits from neighbors at first (who now own TV)	6.0	7.4	4.7
Visits from more children	5.3	3.2	7.2
Visits from neighbors who had never visited before	4.3	6.9	1.9
TV as a means of entertaining	1.0	1.1	0.9
Neighbors afraid to impose on TV owners	0.5	1.1	...
Too many visitors	0.5	1.1	...
Neighbors complain of noise	0.5	...	0.9

be the writer's opinion that the social scientists may very well have a medium through which the trend of family life disintegration may be arrested. Moreover, it is possible, once this medium has received widespread acceptance, that it can become an important tool for raising the cultural level of the population, and, incidentally, for broadening the areas from which they may receive amusement and recreation. This situation could be analagous to the great interest stimulated in classical music after radio had become an important source of enjoyment.

Changes in Family Relationships with Friends

In the past year numerous cartoons and stories have appeared in the public press depicting humorous neighborhood situations which have befallen many families once they have become the proud possessors of television sets. This study gives little evidence that such events are common, 62.4 per cent of the families stating that there has been no substantial effect on how they get along with neighbors and friends. More than a third of the families do indicate, however, that some changes in relationships have taken place. The details are best seen in Table IV.

A complement of the preceding question would be the exploration of the possibility that television set owners may have visitors who come regularly to watch the programs. Approximately 49 per cent of the families report that they have, on the average, some five to six visitors who come for that purpose in any one week. Most visitors come on Tuesday night. Friday, Monday, and Wednesday evenings are the next most popular in that sequence. The most popular afternoon for visitors seems to be Sunday. Almost 50 per cent of all the visitors come to watch a specific program or programs.

A more delicate question followed the above when the interviewers asked of the families whether owning a television set had had any effect on family relationships themselves. There was an interesting difference in the response to this question, 64.8 per cent of the men and only 54.5 per cent of the women felt that such effects were apparent. In addition, a rather substantial group felt that some changes had been wrought. It seems that one of these was the increase in "bickering" over the program to which the set should be tuned. Other interesting results were reported. The children spent more time indoors; the family spent more time at home; there seemed to be more difficulty making the children eat; and, the children went to bed later than before the set was acquired. The detailed findings of this question may be seen in Table V.

TABLE V

General and Specific Effects of Television Ownership on Family Relationships

	Total	Male	Female
General			
No	59.4	64.8	54.5
Yes	41.5	37.2	45.4
Specific			
Slight bickering over programs wanted	7.8	5.3	10.0
Everyone seems to stay home more	6.5	4.8	8.1
Seems to bring everyone closer together	6.5	7.9	5.2
Children more quiet; easily entertained	6.0	5.9	6.2
Difficulty getting children to eat	4.0	2.7	5.2
Children retire later than they should	3.0	2.0	3.8
Educational benefits for children	1.8	1.6	2.0
Whole family more quiet and settled	1.5	2.0	1.0
Fewer arguments than with radio	1.3	0.5	2.0
Stimulates more conversation in family	1.0	1.6	0.5

PROGRAM EVALUATION

In the past twenty years radio programs have improved tremendously both in technical quality and composition. The public has become accustomed to professional perfection in the execution of each program. Voices are well modulated; timing is excellent; the sound effects are extraordinarily realistic; and, even the commercials, in some cases, have been so well integrated with the content of the program that much of the aversion that seemed to have been built up toward them has been eliminated. If the fact that the execution of a radio program is difficult is accepted, then, it would seem that the efficient consummation of a television program would be impossible. In addition to the problems typical of radio programming, television has many peculiarities of its own such as lighting, staging, and costuming. It seems likely that the programs of today will be considered relatively crude when examined ten years from now.

Despite the relatively unfinished aspects of some presentations less than 0.5 per cent of the sample found reason to object to all programs. Approximately 22 per cent of the families interviewed say that none are objectionable. The choices stated run the gamut from variety shows to classical music. The first five programs in order of preference are variety shows, sports, plays, popular and light classical music, and news of current events. This sequence is for families as a whole but does not hold when the programs are examined in the light of men's and women's preferences. Under the male grouping the sequence is variety shows, sports, plays, news of current events, and popular and light classical music. The women enjoy variety shows, plays, sports, popular and light classical music, and quiz programs in that order.

It is important for television program directors and time buyers to know what programs enjoy the greatest popularity. From the social scientist's viewpoint this is also important since it may indicate to him some of the challenges which lie before him, not only in increasing the quality of the program but also in altering the sequence of preferences in the light of a concentrated educational program designed to broaden the scope of things the audience might enjoy. For example, plays have a relatively preferred position among Philadelphia families. Some great dramas, read by many while in school with little or no real enjoyment, could become much more inspirational in their visual presentation and

the more so because the audience is not forced to go outside the home. The latter, in some cases, is an obstacle to many whose tastes dictate this kind of recreation but who have neither the time nor the money to visit a legitimate theatre in the downtown city area.

For a more complete examination of the kinds of programs preferred and disliked the reader is referred to Tables VI and VII presented below.

TABLE VI

Types of Television Programs for which Preferences were Expressed

Kind of Program	Total[1]	Male[1]	Female[1]
Variety shows	87.9	83.6	91.9
Sports	57.9	80.3	37.8
Plays	40.8	34.6	46.4
Popular and light classical music	19.6	16.0	23.0
News of current events	18.9	19.7	18.2
Quiz programs	16.9	11.7	21.5
Children's programs	14.1	12.2	15.8
Movies	12.8	10.1	15.3
Family life	12.8	6.4	18.7
Women's programs	4.3	...	8.1
Miscellaneous	3.8	6.9	1.0
Classical music, including opera	1.5	1.6	1.4
Don't know	0.3	0.5	...

[1] Percentages will not total 100 per cent because of multiple answers.

TABLE VII

Types of Television Programs to which Objections were Expressed

Kind of Program	Total[1]	Male[1]	Female[1]
None objectionable	22.4	21.3	23.4
Variety shows	17.1	14.9	19.1
Sports	13.1	6.9	18.7
Movies	11.3	12.8	10.1
Children's programs	9.6	10.1	9.1
Women's programs	5.0	6.4	3.8
News of current events	4.8	6.4	3.3
Plays	3.3	3.7	2.9
Family life	2.5	4.3	1.0
Popular and light classical music	2.3	2.7	1.9
Quiz programs	2.0	4.3	...
Miscellaneous	1.0	1.6	0.5
Classical music, including opera	0.3	0.5	...
Don't know	11.1	12.8	9.1
No answer	4.8	5.9	3.8
Only tune in ones liked	4.3	2.1	6.2
All objectionable	0.5	1.0	...

[1] Percentages will not total 100 per cent because of multiple answers.

In order to complete the discussion on program preferences, the sample families were asked what they would like to see on television in the future. Some 19 per cent of the men and approximately 11 per cent of the women were satisfied with the current types of programs. More than one-fifth of both groups requested that current movies be shown. In view of the previously described decrease in movie attendance which seemed to result from the introduction of television, this fact may indicate an untapped and potentially profitable market. Some efficient method for paying for this privilege would have to be worked out with a minimum of inconvenience to all concerned, however.

Some of the other things suggested are more modern plays, current stage shows, operas, operettas, symphony concerts, and more educational and discussion groups. One of the most important suggestions is that more so-called "top talent" be used in television programs.

Views on Commercials

No analysis of television program preferences is complete without a discussion of commercials. A little more than one-third of the families said that the commercials were acceptable while less than 3 per cent felt that all types were objectionable. As in previous analyses of preferences there is a substantial range in the likes and dislikes of the family groups. The differences between male and female choices again show up significantly. For example, the males have rated the commercials of the beverage manufacturers as those they liked best, while the females put this category in third place and ranked gasoline advertising the highest.

Cigarette advertising is the most disliked of all the commercials, but it is noted that only 10.6 per cent of the respondents find reason to object even to this form of advertising. It should be pointed out that, although some commercials may have been disliked, it was not always the text that was criticized but rather the presentation or the number of interruptions during a program. It appears, thus, that the acceptance of television commercials is a function of many things, i.e., verbal presentation, periodicity, text, and/or visual presentation.

Additional categories of likes and dislikes may be seen in the detailed breakdowns presented in Tables VIII and IX.

TABLE VIII
Commercials Preferred, By Commodity Classes

Kind of Commercial	Total[1]	Male[1]	Female[1]
Beverages	33.8	42.6	25.8
Gasolines	32.2	34.0	30.6
Cigarettes	29.0	30.9	27.3
Wearing apparel	18.6	16.0	21.1
Automobiles and automobile accessories	17.4	16.6	16.3
Food products	16.1	13.3	18.7
Household furnishings	8.6	9.0	8.1
Household appliances	5.5	4.8	6.2
Razors and razor blades	4.8	8.0	1.9
Drugs and drug products	2.0	1.0	2.9
Miscellaneous	1.8	3.2	0.5
Don't know	8.6	6.9	10.1
Never notice	3.8	1.0	6.2
No answer	2.8	2.1	3.3
All objectionable	2.5	1.6	3.3

[1] Percentages will not total 100 per cent because of multiple answers.

TABLE IX

Types of Television Commercials to which Some Objection was Expressed.

Kind of Commercial	Total[1]	Male[1]	Female[1]
All acceptable	34.3	34.0	34.4
Cigarettes	10.6	12.2	9.1
Household appliances	6.3	6.4	6.2
Automobiles and automobile accessories	5.0	4.8	5.3
Beverages	4.0	3.7	4.3
Razors and razor blades	3.8	5.9	1.9
Food products	2.8	1.0	4.3
Wearing apparel	2.5	2.7	2.4
Gasolines	2.5	2.7	2.4
Miscellaneous	1.5	1.6	1.4
Drugs and drug products	0.8	1.0	0.5
Soap and soap products	0.8	1.0	0.5
Household furnishings	0.5	...	1.0
Don't know	17.1	17.6	16.7
No answer	11.1	9.0	12.9
Never notice	4.3	2.7	5.7
All objectionable	2.3	2.1	2.4

[1] Percentages will not total 100 per cent because of multiple answers.

Marketing Information

Professional marketing research men are aware that it has been impossible to measure directly the effectiveness of advertising.[4] With this in mind, it was thought that it would be interesting to ask the sample, "Do you remember buying anything as a result of watching any television program?" Some 67 per cent of the men and 61.1 per cent of the women said that they **had not.** Reported purchases of the more than one-third of the families resulting from witnessing television programs are classified into the categories found in Table X.

An examination of buying behavior resulting from the impact of television could not be complete without questioning the respondents on proposed future purchases or purchasing habits. They were asked, "Do you plan to buy anything as a result of watching any television program?" Almost 75 per cent of the families said they did not anticipate making any purchases on this basis in the future. Some 6 per cent said they did not know. Of the 20 per cent who indicated that they expected to buy a commodity or commodities in the future, more of them intimated that they would buy household appliances than any other category of articles.

[4] Some progress has been made in this field in measuring advertising readership, recall, or the general impact such programs may have on their audience. However, with the exception of special cases, such as the use of a coupon appended to an advertisement or the hidden offer planted in the heart of advertising copy, it has been almost impossible to relate directly the amount of money spent on advertising through any single medium or combination of media to the resulting number of sales—if any.

One of the greatest contributions that marketing research can make to business would be the derivation of a series of empirical formulae with which an advertiser might work out the exact relationship that a given expenditure on advertising might have on producing a specific number of sales. In the opinion of this writer, attempts to predict social phenomena are relatively crude because of the dearth of methodological knowledge in the Social Sciences. To achieve the objective stated above, it will be necessary to make many fundamental advances in the various disciplines.

When and if this aim is brought to fruition, business men can look forward to an increase in the efficiency of distribution with a resulting decrease in the wastes which are sometimes believed to be a direct outgrowth of unscientific and unpredictable advertising appropriations.

TABLE X
Reported Purchases Resulting from Watching Television Programs

	Total	Male	Female
General			
No	64.0	67.0	61.1
Yes	36.0	33.0	38.9
Specific			
Beverages	12.1	8.7	15.6
Food products	9.8	5.3	13.8
Gasoline	4.8	7.5	2.4
Cigarettes	4.3	4.8	3.8
Household furnishings	3.8	1.1	6.2
Television accessories	3.5	3.8	3.3
Drugs and drug products	3.1	1.6	4.3
Razors and razor blades	3.1	4.8	1.5
Soaps and soap products	2.1	0.5	3.3
Automobiles and automobile accessories	1.5	1.6	1.5
Wearing apparel	1.3	0.5	1.9
Household appliances	0.8	1.1	0.5
Miscellaneous	0.8	0.5	1.0

Equipment

Of all the sets found in the sample homes, Philco and R.C.A. were the two reported by far the most frequently. Table XI shows all of the brand standings for the sample studied.

TABLE XI
Ownership of Television by Brand for the Philadelphia Sample Studied

Kind of Set	Percentage of Ownership
Philco	33.0
R.C.A.	26.7
Admiral	7.6
Emerson	5.8
General Electric	4.9
Motorola	4.0
DuMont	2.8
Tele-tone	1.8
Garod	1.8
Crosley	1.3
Magnavox	1.3
Westinghouse	1.3
Self-made	1.3
Mentions of less than 1%	6.2

The television set with a ten-inch tube seems to be the one most frequently owned within the sample of families studied. The seven-inch tube and the twelve-inch tube follow in that sequence of preference.

An analysis of the shape of the screens of television sets reveals that 44.2 per cent are rectangular, 39.7 per cent are square, and 13.8 per cent are oval or round.

Although there has been some discussion in newspapers and in magazines of the effects on the eyes of watching television, only 29.9 per cent of the group surveyed reported that they had a filter and only 10.7 per cent reported a magnifier attachment.

From the sample studied, it is apparent that most of the sets in use were between four and six months old. Table XII records a complete tabulation of length of time of ownership of sets now in use within the sample in Philadelphia.

TABLE XII
Length of Time Television Sets Have Been Owned

Length of ownership	Percentage of families
More than one year	21.4
10-12 months	10.7
7-9 months	21.0
4-6 months	26.8
0-3 months	17.4
No answer	2.6

As a matter of interest, the families were asked how they happened to acquire their television sets. Almost 80 per cent of the families had purchased their sets, some 9 per cent had received them as gifts, and the remainder had obtained them in miscellaneous ways.

Occupational Characteristics of the Television Set Owners

It would be doubtful that the population characteristics of television set owners would be in the same proportion as those for Philadelphia residents as a whole. It is also questionable whether this could happen until the distribution of television ownership is as wide as that of radio. Some 98 per cent of this city's families have one or more radios, while it is estimated that less than 15 per cent of the families have television sets.

Inasmuch as television ownership is limited, a study of the owner's characteristics might very well indicate the markets that still seem relatively untapped and those which may be reaching the saturation point.

One of the more important socio-economic characteristics of a family group is the major occupation of the head of the house. In a broad way this would indicate economic status, educational level attained, and potential cultural interests. In this study such information was collected and every attempt was made to tabulate it by census classifications. However, in some cases it was difficult to classify the reported occupation of the respondent because of lack of detail necessitating the substitution of judgment for fact.

If it is assumed that there is a representative cross-section of television set owners, then some interesting facts are brought to light when the occupational data are compared with those found in the 1940 Census for Philadelphia County. (See Table XIII)

It appears that the total number of television sets owned by each of the main occupational groups is nearly the same although there are substantial differences in the number of persons composing each group. Thus, proportionately, the number of professional and managerial workers having television is greater than the number of clerical and sales personnel, craftsmen, foremen, and operators. Such a condition is reasonable since, in the beginning, television was sold as a luxury product, mainly to the higher income market. Recently, as mass distribution techniques have been introduced, with sharp reductions in price, the market has been extended to include all occupational groups and the number of sets owned by persons other than those employed in professional and managerial pursuits has been increasing. Since the greatest proportion of total population is found among the clerical, sales, craftsmen, foremen, and operator groups, and because this market has been newly opened, the largest potential sales area would appear to be in these occupational categories. By the same token, the disproportionately heavy, early purchases among the professional and managerial groups would seem to point toward a reduced sales potential among them.

TABLE XIII

Comparison of Occupational Distribution Among Television Set Owners with 1940 Census

Occupations	% TV Owners	% 1940 Census Philadelphia County
Professional and semi-professional workers	12.2	6.3
Proprietors, managers, and officials	12.2	10.6
Clerical, sales, kindred workers	15.1	19.3
Craftsmen, foremen, kindred workers	15.1	20.6
Operators, kindred workers	10.6	24.5
Service workers (except domestics)	13.1	10.1
Unskilled Laborers	8.1	8.0
Miscellaneous (retired, disabled, students)	8.1	0.6
Unemployed	1.5	...
No answer	3.5	...

Summary

The foregoing is a study of the social impact of television on a sample of set owners within the city limits of Philadelphia. It was composed of 226 families from 50 randomly selected blocks. In view of the limitations of this study the writer suggests that no general conclusions be drawn until additional comparable data have been collected.[5]

The specific findings of this study may be summarized as follows:

1. The most striking change in leisure time activities following the installation of television has been the reduction of movie attendance and radio listenership for all adults. The number of evenings which family members remained at home increased from an average of five to six per week. However, with the exception of watching the television set and entertaining a little more, the respondents report no new leisure time activities.

2. One of the most important effects of television set ownership on family relations with neighbors has been the increase in number of visits from neighbors and resultant better relations. Almost half of the families report that they have on the average some five to six visitors who come to watch television programs in any one week. In addition, approximately 42 per cent of the families felt that having a television set affected intra-family relationships.

3. Families appear to prefer variety shows, sports, plays, popular and light classical music, and news and current events. However, some differences in program preference is noted between males and females. More than one-fifth of the families indicated that none of the programs were objectionable; more than one-fifth of the families requested that current movies be shown; and, some suggested an increase in the presentation of modern plays and current stage shows.

4. A little more than one-third of the families said that television commercials were acceptable while less than 3 per cent found reason to object to all of them. Beverage and gasoline advertising were given the highest preferences while cigarette advertising was disliked most frequently.

5. Purchases of beverages and food products were the most frequently made as a result of watching television programs. However, more than two-thirds of the families reported that they had made no purchases nor did they anticipate making any purchases of products which were advertised over television.

6. Philco and R.C.A. television sets were owned by more than half of the reporting families. The ten-inch tube and a rectangular screen seemed to be the most popular. Almost 80 per cent of the families had purchased their sets while some 9 per cent had received them as gifts.

7. The number of television sets owned is presently about the same among all occupational groups. The greatest potential market seems to be among the clerical, sales, craftsmen, foremen, and operator occupational categories.

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[5]The students who were members of the Marketing Research class and who participated in this study were: The Misses Dorothy Osler and Betsy Robb; and the Messrs. Herbert Bellet, Ralph Bromer, William Carrigan, Harry Crane, Marion DeBolt, Herbert Desman, Charles Ebersbach, Robert Fisher, Joseph French, Edwin Gessel, Morton Glazer, George Hallstein, Harry Ingram, Owen Larkin, Alfred Lowe, John Normile, Alexander Rodger, John Stayt, Clarence Steele, Seymour Trabin, Joseph Trigiani, Carl Van Aken, Stanley Voice, Morton Watnik, Clifford Wilcox, William Williams, and Walter Zwickel.

The writer also wishes to acknowledge the untiring efforts of the secretary to the department, Miss Margaret Willard, who spent much of her own time in completing the tabulation of the data.

Some Observations on Current Investment Trends

by STANLEY F. CHAMBERLIN*

INVESTMENT in the economic sense may be defined generally as the creation of capital. More specifically it is the process whereby current income is diverted from consumption to the creation of capital goods. In this sense investment is controlled directly and indirectly by the economic and social institutions. In a free economy the rate of capital formation is determined largely by anticipations of profitability. Such appraisal is based upon forecasts of future levels of income and the pattern of its distribution. It also considers consumer and producer psychology or beliefs regarding future business activity (i.e., the pattern of spending to be expected of all consumer groups at any given level of income), the psychological reactions of consumers and producers to these expectations, government fiscal policy, and the general rate of economic growth evident in the current trends. An investor, excluding insurance buyers, the insurance companies and other institutions, would be concerned either as an entrepreneur directly in establishing a new business or liquidating present enterprises or, indirectly in the purchase or sale of investments through the stock market or investment banking institutions.

Since the rate of capital formation is determined in the last analysis by the sum of the individual forecasts of expected market movements or effects, any summary of this total appraisal would automatically serve as a guide to the market trends. Any number of financial services using mechanical or combination mechanical-theoretical analyses have been developed to make use of stock market price movements as a means of serving this purpose. Out of these, the Dow-Jones Averages are probably the oldest and best known of the purely mechanical forecasts. It would be interesting to test the validity of these analyses over a short period of time, although one must note that this is, in a sense, testing a truism. It is evident that an expression of the composite market opinion must of necessity be reflected in movements of that market in succeeding trading days. However, the fact of opinion may serve to give some evidence of expected longer term movements which may be useful as a guide to making overall as well as individual policy. It is the purpose of this article, therefore, to review the forecasts of the Dow-Jones analysis during the summer of 1948 along with developing market trends to observe the relationships established and to suggest the possible causes and effects of such movements. Obviously, no forecast can predict specific movement and may have only limited validity as to the timing of such movements. The real question, therefore, restricts itself to whether the general direction of the market movement can be foretold and whether this directional analysis may in fact have some bearing on the actual movement in the subsequent period.

DOW-JONES AVERAGES

The Dow-Jones averages were first published in a daily letter in 1884 and covered the prices of eleven active stocks, nine of which were rails.[1] Because of the high interest in rails at this time, this group was rapidly expanded to include nine other railroads.[2]

The period of rapid expansion for the economy as a whole and particularly for railroads was closed by the panic of 1893. Many changes in the growth of the economy followed, necessitating some ad-

*Stanley F. Chamberlin is an Associate Professor of Finance in the Temple University School of Business. He is also engaged in investment and financial consulting.

[1]The eleven original stocks were Chicago and Northwestern, Chicago, Milwaukee and St. Paul, Delaware, Lackawanna, Lake Shore, Louisville & Nashville, Missouri Pacific, New York Central, Northern Pacific Pfd., Pacific Mail, Union Pacific, and Western Union.

[2]These were Delaware and Hudson, Canadian Pacific, Erie, Jersey Central, Missouri, Kansas & Texas, Omaha, Oregon Trans-Continental, Richmond Terminal, and Texas & Pacific.

justment of the market services to make them serve investors' needs. Because industrial shares were increasing in importance and since the general movements between the groups were only vaguely similar, the Dow-Jones Company established a separate average for industrials, which first appeared in the **Wall Street Journal** on June 5, 1896, along with the revised rail index. The latter was based on twenty railroad stocks and the industrial average was based on twelve industrial stocks.[3] These were simple averages of closing prices at this time. New companies were added to the industrial list from time to time and from 1916 to 1928 twenty issues were included in the index.[4]

One year later the Dow-Jones Company published an average of twenty (later reduced to fifteen) public utility stock prices. The company then had three averages, one for rails, one for industrials, and one for utilities as well as a composite based on the total of these three. Each has its own use and limitations but that most widely used, because of its relationship to industrial production, is the Industrial Average.

INDUSTRIAL AVERAGES SUMMER 1948

From June 15 to September 27, 1948 the Dow-Jones Industrial Average fell from a high of 193.16 to 175.90. Following their analysis, a decline was forecast as the market direction. Although the market rallied to a high of 190.19 on October 23, the decline continued thereafter to a low of 161.6 in May 1949, confirming the market forecast established by the movement during the summer months of 1948.[5]

GENERAL BUSINESS TRENDS

Other indicators of business activity may now be examined to determine whether the general trend established by the market forecast was borne out by subsequent events. Incidentally, some observations on the causes of these movements may be developed out of this analysis from the correlation of events and market activity. As a means of pointing up some of these causes, the railroad industry will be used in part as an example and its activity analyzed in some detail.

Industrial Activity

The trend of industrial activity has been downward since the latter part of October 1948. From October 1948 to June 1949 the Federal Reserve Index of production declined from 195 to 169 or by 26 points. A further decline of an estimated 2½ per cent was reported for June 1949. The decline continued and a low point was established in July 1949. From this point, industrial production pushed upward with noticeable vigor and September figures maintained the pace displayed in August. Two very perplexing conditions presented themselves, however, to cloud the economic picture. First, there were the series of currency devaluations touched off by the announce-

[3]The twelve industrial stocks that appeared in the first average were American Cotton Oil, American Sugar, American Tobacco, Chicago Gas, Distillers Corporation, General Electric, Laclede Gas, National Lead, North American, Tennessee Coal and Iron, U. S. Leather Pfd., and U. S. Rubber.

[4]The average was obtained by dividing the sum of values of closing prices of one share of stock, adjusted for split-ups, for each corporation selected by the total number of shares. Adjustments were made for stock splits as they occurred. Subsequently it was decided to adjust the method of computing the average to compensate for splits without using the adjusted total shares. On September 10, 1928 the sum of the prices of the twenty stocks adjusted for stock split-ups was $4,776.40. This sum divided by 20 gave an average for the day of 238.82. Unadjusted the sum of the twenty stocks was $3,033.01. This figure, when divided by the above average, gave a quotient of 12.7. Thus it was shown that the sum of the actual quotations divided by 12.7 gave the same average as was obtained by dividing the sum of the adjusted quotation by 20. Since that date the averages have always been computed by using unadjusted quotations with an adjusted divisor. As the number of stocks included in the Dow-Jones averages has increased the divisor has been adjusted to keep the series comparable. For example, when the number of issues was increased from twenty to thirty stocks in October 1928, the divisor was changed from 12.7 to 16.67. Dice and Eiteman, **The Stock Market**, McGraw Hill Co., New York, 1941, pp. 329-330.

[5]The brief rally in October was stimulated by political anticipations and during subsequent months was reversed to follow the summer trend movement.

ment of the devaluation of the British pound on September 18, 1949. Second, was the unfortunate termination of the labor - management negotiations in the steel and coal industries which resulted in a strike in both cases, and which at the present writing (October 26, 1949) show little promise of settlement. A continuation of such conditions will inevitably wipe out earlier gains and be reflected in lower fourth-quarter earnings in industry and for the railroads. Altogether, from October to July the Index fell by about 30 points or by a little more than 13 per cent from its peak of 195.

There is some difference in the components of the change (downward movement) in May and June as compared with that for the earlier months. The mid-winter decline was general while that during May was almost entirely confined to the durable goods industries. The index for durable manufacturers dropped from 213 to 201 from April to May 1949. Steel production stood at 103 per cent of rated capacity in March 1949, 93 per cent in May and declined to 84 per cent in the week beginning June 30, 1949. One major exception may be noted, however. The automobile manufacturers were turning out new cars at record rates for the post-war period in both of these latter months. Slight increases were noted in the production of some consumer items such as woolen textiles, petroleum and coal products, rubber products and manufactured foods, except meats. These advances were more than offset, however, by the smaller output of the heavy industries.[6]

This situation of mixed advances and declines is aptly explained in the **Business Bulletin**[7] of the Cleveland Trust Company as follows:

> "The course of business recession might be likened to sliding down-hill until a valley is reached. Beyond the valley lies recovery in the form of another hill. In the second half of 1946 nearly all industries were ascending the first hill, while thus far in 1949 nearly all have been moving down the other side. But the two intervening years of 1947 and 1948 showed no such similarity of movement. Thus five of the seventeen industry-groups in the production index had passed the peak by the middle of 1947 and five more had done so by mid-1948.
>
> In this sort of piece-meal readjustment, it is reasonable to assume that the industries which first climbed to the top of the hill would be among the earliest to arrive at the valley below before starting on the next rise. Such a tendency appeared near the end of the past business declines, though not uniformly. But there has been little evidence of that kind of leveling-off, at least through the end of May. The first five industry groups to achieve their quarterly high points in production were leather and shoes; rubber products; non-ferrous metals and products; stone, clay, and glass products; and alcoholic beverages. With the possible exception of leather and shoes, the recent trend of these industries has been downward. In general the same is true of the next five groups in chronological order.
>
> The remaining seven groups were the chief supporters of the final stages of the rise in the over-all industrial production index last year. Five of them, including steel, have now joined the downward procession. The other two are food products and transportation equipment (including automobiles). These have remained about at their peaks except that automobile output was temporarily reduced by a recent strike.
>
> All this indicates that for business activity as a whole, the recession still has some distance to go before reaching the turning-point."

Cost of Living and Retail Trends

An examination of the trend of retail prices from the middle of 1948 to the end of June 1949 may throw some light on the effects of the trend in industrial activity on business at the consumer level. It is noted, however, that any general comparison of retail prices without qualification is impossible. In order to minimize the problems of comparing specific items under changed conditions, the

[6] Other mixed and consumer industries showing declines include lumber, furniture, stone, clay and glass products, cotton cloth and rayon, and chemicals. The paper industry also showed declines despite a small increase in newsprint production. Federal Reserve Board estimates, **Wall Street Journal**, June 28, 1949.

[7] Vol. 30, No. 7, July 15, 1949.

general cost of living index may be used as a rough measure of price change. From July 1948, when the index stood at 173.7, it increased to 174.5 in August, the peak for the post-war period, and then declined steadily to 169.2 in May 1949.[8] A slight rise occurred in June 1949 in the Cost of Living Index to 169.6, but continued downward the following month to 168.5.[9] Food items declined from a high of 216.8 in July 1948 to the low of 199.7 in February and then rose to 202.4 in May of this year. Recent estimates of the Bureau of Labor Statistics indicate a continued rise since that date. The index for wearing apparel increased from 197.1 in July 1948 to 200.4 in December and has declined continuously since. The index was reported at 191.3 in May 1949. Rent and fuel, electricity and refrigeration expenses all have increased although the indices of the latter group are now below the mid-winter highs. House Furnishings have shown a six point decline while miscellaneous expenditures including travel and entertainment have shown an increase of 3.7 points. Obviously the general trend does not tell the story for all individuals or areas. Specific prices and buying habits may increase or decrease the costs for an individual in a particular area.[10] It is sufficient for the purpose of this article, however, to indicate the general downward movement in costs of living.

Further evidence of the general situation can be obtained by comparing total retail sales over the period. The dollar volume has declined slightly, the average being about $5 million per month less in 1949 than in 1948. Average inventories have also declined over last year although the general level remains well above the 1945-47 level. The slight decline in prices is about equal to the decline in inventory values and sales, thus indicating little change over last year in terms of volume. Although the change is not conclusive, the only noticeable trend is a leveling off, perhaps turning downward slightly. From the evidence presented it is clear that the trends in industrial activity and general trade have followed the direction forecast by the Dow-Jones analysis with some time lag.

FACTORS AFFECTING INVESTMENT TRENDS IN THE RAILROAD INDUSTRY

Having observed the market forecast and having reviewed current trends in industrial and business activity, one may wish to establish some of the causative factors. Since investors, generally, are seeking income or profit, it seems logical to direct the inquiry toward trends in earnings and factors affecting them. Because of the many variables affecting each industrial group one broad industry has been selected for special analysis. To that end the writer has selected the railroad industry because of its direct relationship to all others and because of the adequacy of the information available on this group. It is to be noted that the same conditions and trends are applicable in all other industries in varying degree.

Carloadings

The Shippers Advisory Board has released estimates for carloadings in the third quarter of 1949. These show a decline of 7.4 per cent. The actual decline for the first twenty-six weeks of the year (through July 2) amounted to

[8] United States Government, Bureau of Labor Statistics. "Cost of Living Index." See United States Government, Mid-Year Economic Report of the President. United States Government Printing Office, July 1949, p. 105.

[9] Federal Reserve Bulletin, September 1949, p. 1132.

[10] An example of price change in a specific market is as follows: ". . . recently (July 1949) advertised prices of a major national food chain were compared with the advertised prices of the same food chain on the same items in July of last year for the Metropolitan New York area. Prices of this chain vary in different parts of the country on many items. . . . The national food chain . . . sold sirloin steaks in the New York area at 99 cents a pound in July 1948, and in the last few weeks . . . at 83 cents a pound. Pork loin roast was 79 cents a pound. Frying chickens were 57 cents a pound last year and are now 43 cents a pound. Eggs in July last year were 69 cents a dozen and are 69 cents a dozen now, although in August last year they reached a high point of 79 cents. Butter was 69 cents a pound last year but went as high as 95 cents a pound before reaching its peak, and is now 67 cents a pound." **Herald Tribune,** New York, July 7, 1949.

10 per cent. The largest decline (14.3 per cent) is expected to take place in coal carloadings, a fact which will seriously affect the earnings of coal hauling roads. The seriousness of this decline can be appreciated when it is observed that it represents about 60 per cent of the estimated over-all decline in traffic for the entire period. In point of volume the second most important estimated decline is found in lumber and forest products. The balance of the anticipated decline is widely diversified among general shipping. Some items, however, are expected to move in heavier volume in the third quarter of 1949. Chief among these are grains, flour, meal and mill products, some fresh fruits, and vehicular parts as well as automobiles and trucks.[11]

Costs, Rates, and Earnings

Annual Reports of the Class I Railroads to the Interstate Commerce Commission record what has transpired in the railroad industry since 1939. Average costs have risen from 1939 to 1949 by 93 per cent[12] while rate increases granted to the roads by the Interstate Commerce Commission have amounted to a weighted average of only 47.7 per cent.[13] It has been a general and popular misconception that through the years the railroads have earned huge profits. If reports from 1921 to 1949 are analyzed it is observed that the returns on capital invested in operating and non-operating equipment during the entire twenty-eight years come to only 3.62 per cent on the property employed. In the year 1948, which was a year of unusual railroad prosperity, the rate of return increased to 4.38 per cent. It might be further emphasized that in only one of the twenty-eight years under review did the Class I railroads of the country earn the permitted maximum of 5.75 per cent.[14]

The Association of American Railroads reported a decline in net railway operating income to $61,263,279 in June 1949 from $124,972,863 in June 1948. The Association also reported a decline in net railway operating income in the first half of 1949 to $313 million from $411 million in the same period in 1948. Net income alone for June 1949 dropped to $43 million from $94 million in June 1948. Net income for the first six months of 1949 dropped to $173 million from $262 million in the same period in 1948. When present union demands for increased wages are considered along with the introduction of the forty hour work week for non-operating employees which went into effect September 1, 1949, it is estimated that the railroads will show a net return on property investment for the year 1949 of 3.12 per cent. If the increased rate applications now under consideration by the Interstate Commerce Commission are granted in full, the earnings rate would be increased to 3.79 per cent for this

[11]The estimated declines in carloadings by area expressed in percentages is as follows:

Allegheny	—15.6%
New England	—15.0
Southeast	—10.3
Mid-West	— 9.9
Ohio Valley	— 9.1
Atlantic States	— 8.0
Pacific Northwest	— 7.3
Southwest	— 6.7
Central Western	— 3.7
Pacific Coast	— 1.6
Trans-Missouri-Kansas	— 1.3
Northwest	— 0.2
Great Lakes	+ 0.9

It is apparent that the Allegheny area, mainly a coal region, shows the highest percentage of decline while the Great Lake area shows the only percentage increase, largely as a result of the automobile industry activity. These declines in carloadings must of necessity be associated with a decline in revenue. **Commercial and Financial Chronicle,** New York, July 14, 1949, p. 20.

[12]The Pennsylvania Railroad has broken down its costs into a schedule and shows the following increases: wages, 94 per cent; steel parts, 79 per cent; diesel fuel, 76 per cent; coal, 118 per cent; lumber, 114 per cent; payroll taxes, 88.6 per cent, or an average of 93 per cent. United States Government Printing Office, Reports to the Interstate Commerce Commission of Class I Railroads in the United States, June 30, 1949.

[13]From 1939 to 1949 rate increases have been granted as follows: freight, 55 per cent; passenger service, 40 per cent; mail service, 25 per cent; and express service, 63 per cent, or an average of 47.7 per cent. **Ibid.**

[14]The O'Fallon decision of the Interstate Commerce Commission under the Transportation Act of 1920 states ". . . a fair return on the aggregate value of the railway property of the carriers will be 5.75% of such aggregate property value as a uniform percentage for all rate groups or territories designated by this Commission."

year. On the other hand, if, under the same assumptions, the rate increases are disallowed, the rate of return will drop to 2.31 per cent for this year.

A review of the rail investors situation leads to certain interesting observations. Class I railroads have paid out in dividends during the past eight years less than 40 per cent of their net earnings. The balance (60 per cent) of net income has been used for new equipment and modernization of railroad property. In addition, the roads have spent an additional $2.3 billion, obtained by borrowing, on improvement programs. It has been estimated that the gross investment of the railroads during the period from 1941-49 amounted to one half billion dollars more than the total of their net earnings during the same period. It is evident from these facts that the roads have been constantly seeking to improve their position with new and more modern equipment.[15]

The forty hour week rule put into effect at a time when the roads were already beginning to feel the impact of declining business will have major repercussions in the industry. It is noted furthermore, that the railroads have had to put the forty hour week into effect in a single step, whereas other industries have reduced number of working hours per week gradually over a period of years, thus having opportunity to adjust themselves to rising costs. The end result of its application is, of course, an increased payroll for the same amount of production.[16]

It must be noted also that the railroads have been subject to extreme competition from rapidly expanding trucking companies and airlines in the field of interstate commerce. These companies have rights of way which are partially maintained and repaired at public expense. It is also to be observed that these concerns, through their lobbies, have been able to exert the pressure needed to exact favorable legislation from many legislatures. Such advantages have enabled them to operate on a highly advantageous basis in competition with the railroads.

A review of the cost-earnings situation faced by the railroads, increasing costs and more slowly rising rates, has a further implication which must be noted. Rate increases have been granted and shippers have been forced to accept the increases but the effect has been to limit, in many instances, the markets for goods. Rising freight rates in numerous cases have pushed back the sales boundaries of many companies which formerly enjoyed national distribution. One west coast firm that enjoyed eastern distribution now finds its cost boundary at Denver, Colorado. Another California corporation last year paid $2 million in

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[15]It may also be interesting to compare this fact with the recent accusation that the railroads would have no difficulty in meeting some of the demands for wage increases if they would move to increase efficiency by the installation of more modern equipment. In the case of one railroad which turned its attention to Diesel power as a means of greater efficiency and reduced costs, the savings that were incurred by the adaptation of Diesel power more than paid the cost during a two-year period, but this same road is now faced with the fact that the savings thus effected are about to be wiped out by new wage demands.

[16]As a means of adjusting to the forty hour week for non-operating employees, the roads had accelerated maintenance, for one thing, which permitted increased layoffs after September 1. The B & O, for instance, had its track walkers out seven days a week despite a sharp drop in the coal traffic due to the institution of a three day week in the coal fields. The Burlington spent 26 per cent more in April for equipment maintenance than in the like month a year ago. The Erie Railroad instituted a maintenance program for 1949 which was about 75 per cent completed by July 20, 1949. It added 379 temporary workers, track men, carpenters, helpers, and signal men— to get the job finished by the end of August (forty hour week was effective in September). It is also replacing watchmen with flashing light signals at highway crossings wherever possible. The Pennsylvania Railroad had cut its payroll from 143,000 last year to 114,000 in June 1949. The New York Central reports increasing use of tamping and ballast cleaning machines. Interlocking plants, control stations, the introduction of automatic office machines and many other devices are being installed. This brief recitation of the measures taken to meet the new work week point to the fact that its existence will eventually price many non-operating employees out of their jobs. In spite of these economies the railroads generally agree that the new rule will necessitate a bigger labor force eventually, but they are doing what they can to meet the problem today.

freight charges to move its product, worth $14 million, to market. The agricultural interests of the West have been hardest hit by increases in rates with the result that huge stocks of processed foods have piled up. This season's crop of vegetables and fruits has been sliding in price, forcing the issue into the lap of the Farm Credit Administration for further subsidy and relief. By similar reasoning, the manufactured goods of the east become increasingly difficult to sell on the west coast. Freight charges are running $200 and up on medium priced automobiles while radios and refrigerators must be tagged $15 to $25 higher in the west than in the east and mid-west, due to freight charges.[17] Some companies have been able to cope with this problem and work out satisfactory distribution plans by opening branch plants elsewhere, thus reducing the potential railroad revenues. Such a program, however, necessitates raising additional funds which, under the present state of uncertainty in the capital market, is extremely difficult.

A fragmentary picture of the position of this industry may be obtained from the foregoing facts. Further aggravation of these conditions is quite likely to result in a reduction of earnings to a point where the roads will be unable to provide sufficient working capital for maintenance or to raise new capital for needed expansion and improvement. The result would inevitably be government ownership with all the losses being paid by the rank and file of taxpayers. There are those who feel that the next step would be state socialism which would not be too unwelcome to many groups which today are eagerly seeking the day when they and their programs will be given full reign. The philosophical drift away from sound principles of business and in the direction outlined above is a familiar ghost in the minds of many who would gladly subscribe new capital, not only to railroads but to every new enterprise, provided that this spectre of ruin and chaos could be removed from the horizon of American investment. This pattern of thought is well imbedded in the American mind today and acts as a positive deterrent in granting support to stock and bond investment.

OTHER CONSIDERATIONS AFFECTING THE INVESTMENT MARKET

A report prepared by Robert R. Nathan, former new Deal economist and presently with the CIO, says:

> "If business can afford to cut prices, it can afford to raise wages and other types of labor income. One or the other has been necessary all during the last nine months. If business refuses to cut prices or raise wages voluntarily in the early stages of a downturn, and the activity deepens, it will be forced to cut prices later to avoid bankruptcy or, unfortunately, prices will be slashed in the process of bankruptcy itself.
>
> "Profits of all corporations in the first quarter of 1949 were running at an annual rate of $31 billion before taxes and nearly $19 billion after taxes. Wages and salaries of all corporation employees except corporate officers, totaled slightly more than $80 billion on an annual rate. This represents profits before taxes of nearly 40 cents for every dollar of wages and salaries. On an after tax basis corporations earned in the first quarter of 1949 about 23 cents for every dollar of payroll except the compensation of officers. . . . There is not any question but that corporations as a whole can afford substantial wage increases."

The economic arguments presented in the above quotation are typical of many that are presented today for uncritical public consumption. In this, as in most other cases where profits are involved, attention is concentrated on the absolute dollar profits. The relationship of profit to cost of investment is ignored completely. Obviously any change in either costs, turnover or investment calls for an equal change in the profits to maintain the status quo. For example, whenever arguments are presented in the cases for wage increases the purchasing power of the dollar is played up dramatically. A logical conclusion, it seems, would bear out the point that a 59 cent dollar means

[17] **Wall Street Journal**, New York, June 28, 1949.

exactly the same thing to the corporation, the stockholder, and the bondholder as it does to the wage-earner.

Cheap money has meant higher costs to government as well as to individuals and business generally. Thus, taxes have been increased. Continued emphasis on deficit programs must ultimately mean continued high or even higher taxes. The unduly high income taxes upon corporations and individuals during peace times are the result of a program that must of necessity be adopted in periods of emergency. Such a program, however, discourages incentive, retards development, and strangles expansion, and in the long run is bound to generate a serious impairment of our national economy. Three principal elements in the present tax program which may be criticized as impediments to the flow of venture capital are first, the steeply progressive surtax rates on individual income; second, double taxation of corporate income, once at the corporate level and then to the individual receiving dividends; and, third the provisions of the capital gains taxes taking profits but allowing only a small part of any of the losses.

It would be well for those members of Congress who believe in higher taxes to consider the effect of this action on the investing public. The many thousands today who have sacrificed current consumption to accumulate capital and have voluntarily exposed it to the hazards and risks of business ventures have made possible the present high rate of production and the consequent high standard of living in the United States. They are justly entitled to some assurance that their interests will be preserved. Venture capital, exposed to such hazards as those discussed above, as well as to the present high rates of taxation and double taxation, will remain in seclusion, and force upon industry the retention and accumulation of reserves to meet the demands for capital expansion.

In a recent article,[18] Sumner H. Slichter, Lamont Professor of Economics at Harvard University, stated that few periods in the history of the world have seen such rapid changes in our economic conditions and institutions as the past several years. These changes may be classified into four important groups. They are (1) the increase in productivity, (2) the shift in power from management to employees, (3) the revolt against markets and the replacement of free enterprise with government guided enterprise, and (4) the development of the welfare state.

That productivity on the basis of output per manhour has increased is a foregone conclusion. But one of the factors that has been lost from view is that a large share of the benefits from technological improvements has gone to labor. These benefits have taken the form of increased wages, unemployment insurance, pensions, social insurance, grants and subsidies of many sorts including improved working conditions and health programs. It is to be emphasized, however, that labor has given little thought to the implications of the economic arguments used to support their claims. It is simple logic that when the price of labor rises faster than output then the price must inevitably advance and the wage gains sought and won are nullified.

The growth of unionism has been largely responsible for the shift in power from management to employee groups. It has also been responsible for the drift from free enterprise toward state guided enterprise. Communities and organizations have come to expect governments to act in the "public interest" through the enactment of protective statutes, through grants-in-aid, subsidy programs, loan programs, and by legislative regulation of so-called industries affecting the public interest. Such changes have been slowly overtaking our economic life and so gradual has been the process that it is only in periods of retrospect and review that they become apparent. Their effect is manifest throughout the economy, but it is particularly evident in the

[18] **Commercial and Financial Chronicle,** June 2, 1949.

area of business and industrial operation.

Of the many other factors affecting business expansion today, government fiscal policy is probably the most important. Particular programs or lack of them may have extreme effects on the action of citizens. In the fall of 1948 the major concern of government was inflation and its dangers. Controls were sought and in some cases granted in the face of evidence that such a condition was nonexistent. The Federal Reserve Act was changed to require additional reserves from member banks in order that additional lending power might be throttled. This summer President Truman presented to The Congress his mid-year Report[19] on the economic condition of the nation recommending the adoption of fiscal programs and policies designed to stimulate business. These recommendations, following almost immediately upon the heels of a valiant effort to secure inflation controls seem to indicate some lack of stability in the view of government officials, a view which has been transmitted to the investor and which has engendered within him a fear complex that has made him completely passive as a financial contributor to corporate enterprise.

CONCLUDING OBSERVATIONS

This fragmentary summary of some of the factors affecting investment trends today makes possible the following observations.

First, stock market movements appear to anticipate with a fair degree of accuracy over-all movements of business activity within the economy.

Second, the principal factors involved in the present trends in the investment market appear to stem from changes taking place in the economic structure, largely as a result of the shift from an agricultural to an industrial economy. The problems engendered by increasing minuteness of job specialization, and complexity of industrial organization with increasing distance between the worker and his product and the capital supplier and industry have brought forth a considerable degree of government intervention as one means of adjusting the situation. It appears that this latter has been a major deterrent to the continued expansion of capital formation within this economy. Whether this is a permanent condition or a temporary one caused by the two preceding emergencies—depression and war—is a matter for history to record. It is to be emphasized, however, that this decision is still in the making and that it is within the power of the public to make clear their policy decision as to direction.

[19] op. cit., pp. 1-14.

An Inductive Study of Demand as Applied to Citrus Fruits

by DAVID FROMBERG*

THE citrus industry, which has soared to major proportions in the western hemisphere, had its origin in the Orient. Although the country of origin is in doubt, it is thought that the orange and citron are native to China, the lemon to India or China, and the lime and grapefruit to the Malay Archipelago.[1] Once introduced into the United States, the citrus industry grew rapidly. It is because of this growth and the adequacy of historical records concerning it that this industry was selected to serve as a vehicle for an inductive study of the law of demand.

The purpose of this study is to analyze the demand for citrus fruit in all uses for the period 1920-40, developing a statistical basis for a statement of the law of demand as applied to this industry. A considerable study of the elasticity of demand for citrus products was undertaken and the significant results will be developed in detail hereafter.

UNITED STATES AND WORLD PRODUCTION

Today the United States is overwhelmingly the largest producer of citrus fruits, growing 95 per cent of all grapefruit and 50 per cent of all the oranges and lemons. Together California and Florida produce more than 90 per cent of United States' oranges, while Florida and Texas account for more than 85 per cent of United States' grapefruit. California alone produces almost all the commercial crop of lemons.

World production of citrus fruit has increased during the past twenty-five years but suffered setbacks, first during the depression of the 1930's and second as a result of World War II. "The United States now produces 55 per cent of the world's orange crop, Spain 8 per cent, Brazil 9 per cent, Italy 5 per cent, Palestine 3 per cent. . . ."[2] The balance of world production is scattered among the other countries, mainly those lying between the 38th parallels north and south of the Equator.

Following the Civil War United States production made great strides, climaxing this growth with an approximate doubling every decade between 1910 and 1940. During this period, citrus production has far outdistanced that of all other fruit put together. (See Table I) Since 1942 the trend has been rising at a decreasing rate but the Bureau of Agricultural Economics forecasts that there will be "by 1969 an approximate doubling of the 9 billion pounds per season of the pre-war years 1937-1941."[3]

MARKETING

Many improvements and economies have been introduced into the marketing process since 1920. New and better means of coloring have been devised and methods of disease and decay control developed. Standards of fruit maturity, juice content, soluble solids, and the solid ratio, however, have not shown much change in recent years.

Since 1935-36 shippers have inclined toward using wire-bound bruce boxes for efficient and economic handling of the fruit. However, as economies are demanded by the consumer desiring low cost consumption, eight pound mesh bags will be increasingly used. Improvements in utilization of mechanical methods of filling and sewing bags will further enhance savings in packing.

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[1]Herbert John Webber and Leon Dexter Batchelor, **The Citrus Industry**, University of California Press, Volume I, 1949, affords a more detailed history of citrus fruits.

*David Fromberg was a candidate for the Degree of Master of Arts at Temple University in 1949. His thesis, "An Inductive Study of Demand as Applied to Citrus Fruits," was written under the direction of Drs. Russell H. Mack and John F. Adams, and Prof. Irwin S. Hoffer. This article is a resume of parts of that study.

[2]Charles W. Smith and Ruth G. Tucker. "World Citrus Production and Trade." (Monograph)

[3]"Readjustments in Processing and Marketing Citrus Fruits." U. S. Department of Agriculture, Bureau of Agricultural Economics, p. 24. See Chart I.

TABLE 1
Comparison Between Production of Citrus Fruits and Other Major Fruits in the United States

	1945		1936-1945 Average	
	Boxes	Bushels	Boxes	Bushels
	Millions		Millions	
Total oranges		151.2		123.9
Tangerines	4.2	6.7	3.2	5.1
Total grapefruit	100.0			70.1
Lemons	14.4			17.1
Limes	.2	.3	.1	.2
Total Citrus		278.4		216.4
Apples		68.0		114.1
Peaches		81.6		62.6
Pears		34.0		29.8
Total Other Than Citrus		183.6		205.5

Source: Division of Agricultural Statistics, Bureau of Agricultural Economics

"There are three principal methods used by growers in selling their fruit. They are: (1) sales through growers co-operative marketing associations; (2) "on tree" sales to shippers who are known as cash buyers; (3) consignment sales."[4] The cost of handling citrus from the tree to the car, excluding packer's operating profits, now constitutes about 19 per cent of all marketing charges and about 14 per cent of the consumer's dollar spent for citrus. A tendency to pack without wraps may reduce the 7.7 per cent of total handling costs claimed by the box of wrapped fruit during the 1940-41 period.

Freight and refrigeration charges have accounted for from 11 to 19 per cent of the consumer's citrus dollar. Because lower market prices before World War II called for economies in transportation, water transportation increased with great rapidity until, in the 1934-35 season, the movement by boat was almost six times that by rail. It is quite likely, however, that the future of citrus transportation will be found increasingly in motor truck movement as a result of its ability to reduce running time and improvements in truck refrigeration.

PROCESSING

Since its inception in the 1920's the citrus processing industry has grown rapidly. The citrus industry apparently feels that processing represents the best present means of increasing consumption per capita. This is of especial importance to the Florida industry because in the 1945-46 season 38.5 per cent of its orange crop, 69.2 per cent of its grapefruit crop, and 11.9 per cent of its tangerine crop was processed. Altogether, the processed portion of the Florida crop amounted to approximately 42 million boxes.

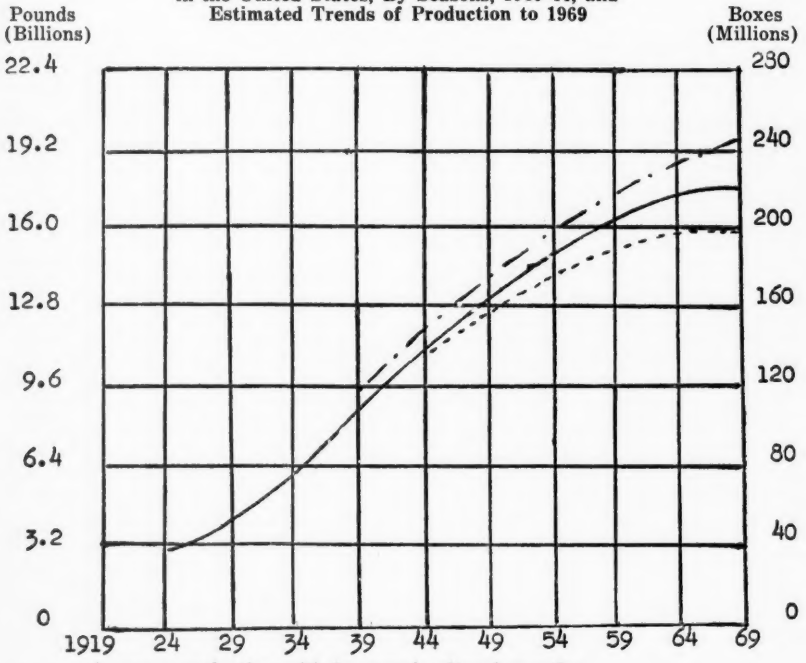
The most important outlet for citrus fruit is, of course, the fresh fruit market. For this, the grower must supply a fruit of standard size and appealing appearance both to meet public demands and to facilitate shipping and packing. Thus, irregularly shaped or poorly colored fruit was regarded as waste until the juice canning industry developed as a method of disposing of the waste or excess product. In more recent years, however, the demand for canned citrus juices has become so great that a large percentage of fruit now is being grown for canning purposes. Wright states: "It is estimated that from 2.5 million to 3 million gallons of concentrated citrus juices were produced in the United States during 1942."[5]

The processing business of citrus fruits goes beyond juice and numbers among

[4] "Citrus Industry of Florida." Department of Agriculture, Tallahassee, p. 169.

[5] H. M. Wright. **Scientific American.** "Using All But the Smell." April, 1943.

CHART I
Total Production of Oranges and Grapefruit Combined, in the United States, By Seasons, 1919-44, and Estimated Trends of Production to 1969



— - — Average production with improved cultural practice.
——— Estimated average production from trees standing in 1944 under prewar cultural practices.
- - - - - Five-year moving acreage of actual production.

its by-products citric acid, orange and lemon oils, marmalades, jellies, and pectates. The residue, after the fruit is processed for juice, amounts to nearly two-thirds of the total weight by volume. The disposition of this waste, once a problem, now goes largely into livestock food, a valuable by-product industry. Others include citrus rinds and brandies, flavoring extracts for soft drinks, seed oils, commercial alcohol, and pectin used in the manufacture of emulsions and lotions. Of these, cattle feeds and citrus pectin are probably the two most promising by-products commercially produced.

LAW OF DEMAND FOR CITRUS FRUITS

Exact knowledge of the effect of variations in price, supply, and demand of important commodities are of utmost importance, both to businessmen and theoreticians in the field of economics. The development of laws or tendencies, determined inductively, could be used to indicate probable effects of changes in supply on price and effects of changes in price on supply and/or demand and would give greater validity to theoretical discussions of exchange. Questions concerning the effect of a reduction or an increase in price on consumption and production could then be approached more realistically. In order to approach this question, however, we must know effective demand at all different prices.

The part that prices play and the resultant of prices on demand in our economic system needs no demonstration.

Demand at every category is influenced by price. Price is one of the governing agents in the body economic, enabling it to adjust its function in times of deep depression or feverish acceleration. Thus, it appears that an analysis of the factors influencing the prices of a considerable number of important commodities could supply some measure of the effect of these various factors or groups of factors on each other and on the general level of prices and, consequently, production.

Many of the questions asked concerning prices and quantities may be answered quantitatively if the coefficients of the elasticities for demand and supply for the commodity in question are known. They are of special importance in solving many of the practical problems of applied economics. The first step in this analysis is, therefore, to derive the best equation expressing the law of demand for citrus fruits and from that law to arrive at the most reliable coefficient of elasticity of demand for citrus fruits.

Before proceeding to derive the law of demand specifically for citrus fruits, the following factors and descriptive information concerning the essential features of the law of demand, the coefficient of elasticity of demand, and the statistical methods relating both to demand and elasticity must be considered.

Assumptions Concerning the Law of Demand

The demand curve must be a continuous function. Statistically it is a series of price-quantity relationships and no matter how fine the data may be, these relationships are discrete. Pigou states: "There is a plausible hypothesis that the rate at which the ratio of price to quantity changes is not likely itself to change by sudden jumps."[6] Actually, between two close points, an extrapolation which does not differ much from a straight line may be assumed. This will give a smooth line of inference. The assumption is that economic actions collectively are objective and frequent and the desire for citrus fruit is continuous and numerous.

(1) The law of demand relates to the entire market for citrus fruits. To eliminate considerations of classes and other variables including delivery, shipping, and marketing costs, this study will be based entirely on marketing at source, i.e., on the farm. As Marshall states: "The more nearly perfect a market is, the stronger is the tendency for the same price to be paid for the same thing at the same time in all parts of the market; but of course, if the market is large, allowance must be made for the expense of delivering the goods to different purchasers, each of whom must be supposed to pay in addition to the market price a special charge on account of delivery."[7]

(2) The law of demand is a succession of points directly derived from quantities and units of time. Yearly points were selected for reasons of availability and ease of handling. The coefficient of elasticity also relates to yearly points on the demand curve and might be altogether different if it were derived from monthly or seasonal data. It is quite possible for demand for a commodity to be elastic for a given period and inelastic for another period. In citrus fruits the value of the entire annual crop will be used in conjunction with total annual production in the United States.

(3) In the law of demand, price may be the resultant of a desire for consumption or the resultant of a desire for speculation. Holbrook Working points out that "A dealer's demand includes not only those who buy solely for resale but also farmers who hold for later sale and manufacturers who buy or hold for future disposition."[8] This type of demand has been called a buyer's or a particular demand.

The demand curve used here is a relationship expressing total quantities sold

[6] A. C. Pigou. "Statistical Derivation of Demand Curves." **Economic Journal,** Volume XL, 1930.

[7] Alfred Marshall. **Principles of Economics,** 8th Edition, MacMillan Company, New York, p. 325.

[8] Holbrook Working. "Statistical Determination of Demand Curves," **Quarterly Journal of Economics,** 1925, p. 512.

and the corresponding prices. This general or consumer demand, as it is also known, includes uses from the citrus left to rot or to feed livestock when prices are low to the high grade citrus sold in the finest markets. Prices are influenced by all uses whether it be the crop commercially marketed or that portion of production withheld from buyers for various reasons. "Consumer's demand or general demand, however, forms the ultimate basis for speculator's demand and the more adequate our knowledge of the factors which influence consumption and the more complete our statistics relative to these factors, the more closely will current prices be determined by these forces. Accordingly, the type of study of most fundamental importance is that of consumer's demand."[9] Thus, in the derivation of the law of demand for citrus fruits, the consumer or general demand curve is used.

(4) The law of demand for citrus fruits is a study of the demand for a good which is in effect, a "closed economy." For many years exports and imports were so slight as to have scarcely any effect on the price of citrus. At no time have exports amounted to over 5 per cent of total production and imports have been even less.

(5) The law of demand for a given commodity is often influenced by the prices and quantities of rival or substitute goods. Thus, when the price of a particular meat changes sharply, it cannot be expected that the prices of other meats, poultry, and fish will long remain unaffected. In the same way, extreme prices in citrus will soon affect the prices of other fruits. However, the dynamic factors which seem to affect prices and consumption of citrus most are the changes in habits of consuming citrus, changes in purchasing power, and changes in population.

Assumptions Concerning Elasticity

"The coefficient of elasticity may be defined as the proportion by which a given relative change in price alters the quantity demanded . . . when the relative changes are small."[10] Specifically, the coefficient of elasticity of demand is the ratio of relative change in the quantity demanded to the relative change in price. In his **Principles of Economics**, Marshall states: "The elasticity (or responsiveness) of demand in a market is great or small according as the amount demanded increases much or little for a given fall in price, and diminishes much or little for a given rise in price."[11]

The coefficient of elasticity of demand may be derived when quantity is the dependent variable and price the independent variable. It is given by the expression $n = \frac{dx}{dy} \cdot \frac{y}{x}$ where n represents the coefficient of elasticity, dx and dy the derivatives, x the quantity, and y price. If the numerical value of the coefficient is 1 for all values of x, a "constant outlay curve," a rectangular hyperbola, neither elastic nor inelastic is the result. If the coefficient is less than 1.0, demand is said to be inelastic, if more than 1.0, elastic. The size of the coefficient thus measures the degree of elasticity.

Several factors concerning the coefficient of elasticity must be borne in mind or erroneous measures may be derived. These factors will be mentioned in conjunction with citrus fruits.

(1) In order to get the coefficient of elasticity of demand for citrus fruit, this study will seek to establish the best law of demand and thus to derive the numerical coefficient from that function. Since this law is derived from a general or consumer demand curve, including all production of the United States and its value at the source, discrepancies between the coefficients of elasticity for different localities which demonstrate the effect of differentials in transportation and other costs are eliminated.

(2) Elasticity of demand relates to a particular point on the demand curve and may vary from point to point. As will be shown later, hypothetical points are

[9] **Ibid.**, p. 525.

[10] Henry Schultz. "Statistical Law of Demand," **Journal of Political Economy.** Vol. XXXIII, 1925, p. 482.

[11] Marshall, **op. cit.**, p. 102.

selected in the demand curve and the coefficient of elasticity determined at these points. The methods used to develop the demand curves from which the coefficients of elasticity were derived will be considered in the following section.

Statistical Assumptions

"There is a true relationship between quantity and price and but one line describing it; if all extraneous disturbing factors could be eliminated the actual observations would all fall on this single line."[12] These disturbing factors are short term movements which are the resultants of the dynamics of our changing economic relationships. Such short term changes were treated in three different ways: (1) by the method of first differences; (2) by the method of link relatives; and (3) by the method of trend ratios. The long term influences that tend to obscure the relation between prices and quantities of citrus are thus eliminated and this makes it clear that the important factors influencing citrus consumption are: (1) changes in food habits; (2) changes in the general price level and/or changes in real purchasing power; and (3) changes in population.

If the economic system were in perfect equilibrium during the years of this study, a trend equation would give, in mathematical form, a law on which all observations of quantity and price would rest. The existence of deviations from the trend line is an indication that disturbing influences are present. It is these disturbing influences which give rise to the short term trends and create different "normals" from time to time. Thus, the "long run" influence has been eliminated from this study.

The Statistical Law of Demand for Citrus Fruits

The three methods selected were applied to raw or uncorrected data for prices and quantities as well as to data for prices and quantities corrected for price level change and population change to derive the law of demand for citrus. (See Table II) Due to lack of space, only the best equation derived for the law of demand, found by the method of link relatives, will be discussed in detail hereafter.[13] Results obtained from all three methods mentioned are tabulated in Table II and the efficiency of the three may be compared.

The results obtained by applying the methods of link relatives, first differences, and trend ratios first to unadjusted data then to adjusted data are shown in Table II. To adjust data, the production[14] and value figures used in the upper part of the table were divided by United States population figures to get per capita consumption and by the Bureau of Labor Statistics Cost of Living Index (1926 = 100) to get price per pound.[15] The type of data used and the method of obtaining the law of demand is shown on the left. In succession across the page are the coefficient of correlation and the coefficient of elasticity derived from each law of demand. The column on the right relates to the coefficient of elasticity of demand and notes specific changes in conditions of production and per capita consumption. This section is of particular value in that it gives, at a glance, the several elasticities encountered under shifting conditions of demand.

METHOD OF LINK RELATIVES APPLIED TO UNADJUSTED DATA

Table III contains data showing total production and the total value of all types of citrus fruits in the United States from 1919-40. Total production and value were obtained by adding the individual production and value figures for each year.[16]

[12]Working, **op. cit.**, p. 525.

[13]The writer has made considerable use of the methods and techniques discussed and illustrated in the works of Doctors Schultz and Moore. See Henry Schultz, **Statistical Laws of Demand and Supply with Special Application to Sugar,** University of Chicago Press, 1928 and Henry Lud well Moore, **Forecasting the Yield and Price of Cotton,** MacMillian Co., New York, 1917.

[14]Production as used here and throughout the balance of the article refers to marketings at the farm or effective demand. See first "Assumption Concerning Law of Demand" p. 27.

[15]See footnote 1, Table II.

[16]U. S. Department of Agriculture, "Agricultural Statistics," 1944, pp. 168-169.

TABLE II
Unadjusted Data

Method	Coefficient of Correlation		Coefficient of Elasticity		Total Production
	1st Degree	2nd Degree	1st Degree	2nd Degree	
Link relatives	—0.800	—0.817	—0.91	—0.63	No change X = 1.0
			—0.74	—0.61	Normal change X = 1.1
1st differences	—0.782				
Trend ratios					
4th degree price, 3rd degree product curves	—0.602				
3rd degree price, 3rd degree product curves	—0.649	—0.626	—0.71		Normal change X = 1.0
			—0.55		10 per cent increase X = 1.1
3rd degree price, 2nd degree product curves	—0.491				
	Adjusted Data				Per Capita Consumption
Link relatives	—0.795	—0.798	—0.82	—0.76	No change X = 1.0
			—0.72	—0.68	Normal change X = 1.063
1st differences	—0.756	—0.764			
Trend ratios					
3rd degree price, 4th degree per capita consumption curves	—0.495				
3rd degree price, 3rd degree per capita consumption curves	—0.754	—0.739	—0.82		Normal change X = 1.1
			—0.65		10 per cent increase X = 1.1
2nd degree price, 3rd degree per capita consumption curves	—0.581				

[1]The first method, link relatives, will be developed in detail hereafter. The second method, first differences, consists of correcting for short term differences by correlation of absolute first differences to arrive at the demand curve. The third method, trend ratios, involves finding the best trend line for both per capita consumption and price per pound, and then the ratio of absolute value to trend value. These ratios, representing different degree trend lines and absolute values, are then paired to get the highest degree of correlation. This line of estimate is the law of demand from which the coefficient of elasticity of demand is obtained by the method indicated in the text.

Both series, from 1919-40, are unadjusted and were taken from production and value totals at the farm.[17] Total value was divided by total poundage to get price per pound.

To correct for disturbing influences in both price and production, the link relatives of the two variables were correlated.[18] The link relatives of the two series mentioned, shown in Table III, are

[17]The years 1919-40 were selected for this study because the war years following were marked by abnormal conditions of rising cost, expanded production, and high prices. If these were adjusted for price and income changes the degree of correlation between the variables would be the same.

[18]The method of link relatives entails finding the ratio of prices or production of a given year to that of the preceding year. These links are a chain of relative changes which, when treated by correlation techniques, will give a line of best fit for the law of demand.

TABLE III

The Total Production[1] and the Prices of Citrus Fruit in the United States and the Link Relatives of Production and Prices, 1919-40.

Year	Total Production (in Thousands of Short Tons)	Price Per Pound (in Cents)	Link Relatives of Total Production X	Link Relatives of Price Per Pound Y
1919	1370	3.417	1.113	.956
1920	1724	3.525	1.259	1.031
1921	1326	3.358	.769	.951
1922	1724	2.513	1.300	.748
1923	2083	1.672	1.208	.665
1924	1748	3.176	.840	1.899
1925	1934	3.180	1.106	1.001
1926	2143	2.958	1.108	.930
1927	1799	4.433	.840	1.498
1928	2945	2.165	1.637	.488
1929	1886	4.181	.640	1.931
1930	3158	1.671	1.674	.399
1931	2778	1.571	.880	.940
1932	2815	1.217	1.013	.774
1933	2675	1.756	.950	1.443
1934	3656	1.355	1.367	.771
1935	3002	1.977	.822	1.458
1936	3641	1.849	1.213	.935
1937	4435	1.082	1.218	.585
1938	5239	.832	1.181	.768
1939	4776	1.104	.912	1.326
1940	5662	1.241	1.183	1.124

[1]Production refers to farm marketings. See footnote 14.

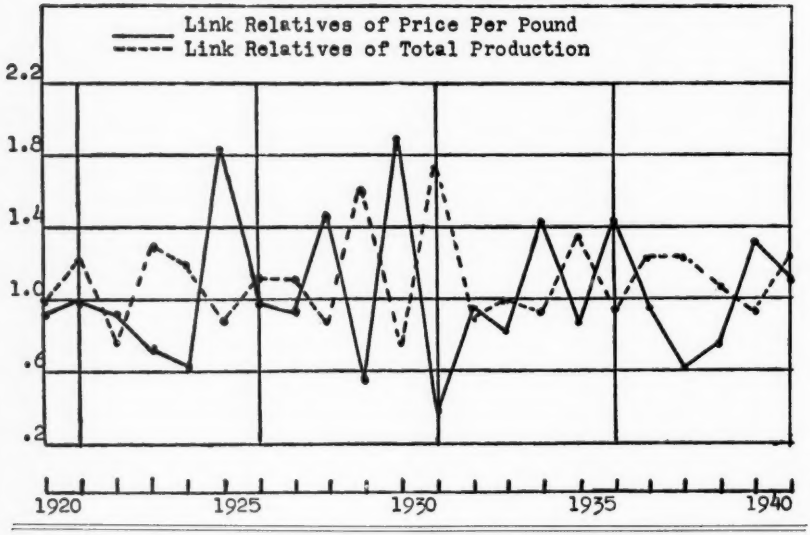
presented graphically in Chart II. It will be noted that a considerable inverse relationship is established. The coefficient of linear correlation is —0.80 while the coefficient of non-linear correlation (2nd degree) is —0.81.

THE LAW OF DEMAND OBTAINED FROM LINK RELATIVES

A line of relationship of first or second degree as the line of best fit for the law of demand for citrus may now be drawn for the data shown in Chart III. In deciding which is the most appropriate demand curve for these data, it must be remembered that all types are hindered by deficiencies. In using a second degree parabola, for example, it is inherent that with extrapolation the parabola trend would rise. This would create a region where higher production would be accompanied by higher prices. Furthermore, the higher the degree of the curve used, the less will be the degree of freedom. A linear curve with extension indicates a region where production takes place without price at the X intercept. Considering these difficulties, it would appear that the free hand method would not be impaired by such disadvantages, but in this case, subjectiveness tends to eliminate some of the advantages of the method.

The method of fitting D_1 and D_2 (See Chart IV) assumes both variables equally subject to error. Either D_1 or D_2 will give the most probable relative change in total production and price of citrus fruit from 1919-40.

CHART II
Inverse Correlation Between Link Relatives of Total Production of Citrus Fruit and the Link Relatives of Price Per Pound of Citrus Fruit



First Degree Equation

The line of equation D_1 is

$$Y_c = 2.4124 - 1.2566X \qquad (D_1)$$

and the line of equation D_2 is

$$Y_c = 3.3847 - 3.0285X + 0.7655X^2 \qquad (D_2)$$

the origin being at O.O. Using equation (D_1) between the years 1919-40, a change of 1 point (roughly 1.0 per cent) in the link relatives of total production is associated with a change of 1.25 points in the relative price. Stated differently, a 1 point change in the relative price is on the average associated with a change of $\frac{1}{1.2566}$ or 0.79 of a point in relative total production.

Using equation (D_1), an estimate of probable change in price corresponding to probable change in production[19] can be made for any year. This will serve to check the validity of the method. In 1924 citrus production was 1748 thousand tons (See Table III) and in 1925 production amounted to 1934 thousand tons. The relative change in production as shown by the link relative was 1.106. Using this value for X in $Y_c = 2.412 - 1.2566X$ and solving for Y_c the probable price for 1925 is 1.0227 times the price of the preceding year. Since the price for 1924 was 3.176 cents, the estimate for 1925 would be 3.248 cents. The actual price was 3.180 cents.

The equation to line D_1 is the law of demand in link relative form. In terms of absolute quantities, $X = \frac{x}{x_o}$ and $Y = \frac{y}{y_o}$ where x_o and y_o are production and prices of the preceding year. (D_1) then in absolute terms is

$$\frac{y}{y_o} = 2.4124 - 1.2566 \frac{x}{x_o}$$

also

$$y = 2.4124y_o - 1.2566 \frac{(y_o)}{(x_o)} x \qquad (D_1a)$$

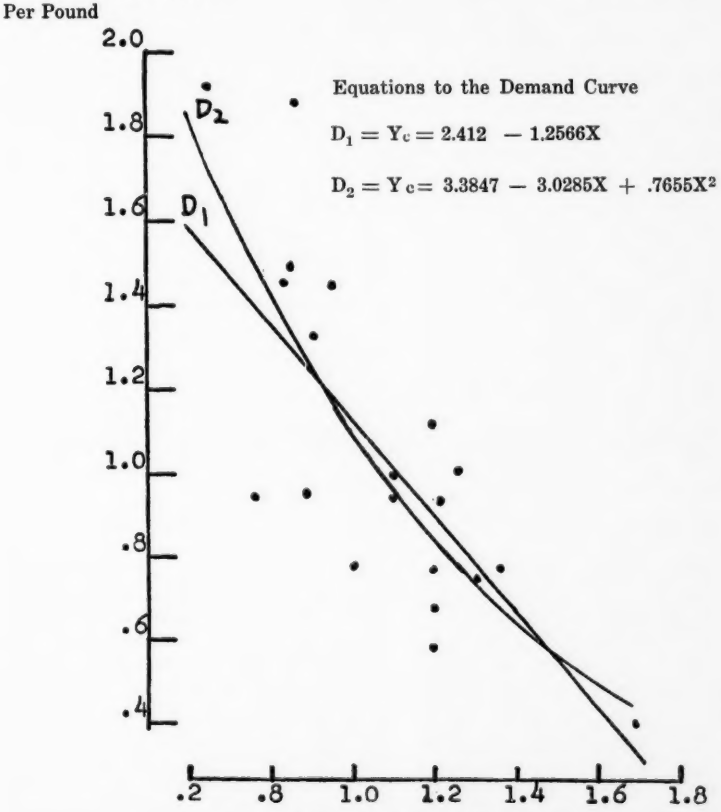
solving for x we get

$$x = 1.9197\, x_o - 0.7958 \frac{(x_o)}{(y_o)} y \qquad (D_1b)$$

To obtain the law of demand for citrus in 1925, the actual production x_0 and actual price y_0 for the preceding year

[19]See footnote 14, p. 29.

CHART III
Scatter Diagram of the Link Relatives of the Total Production of Citrus Fruit and the Link Relatives of Price Per Pound



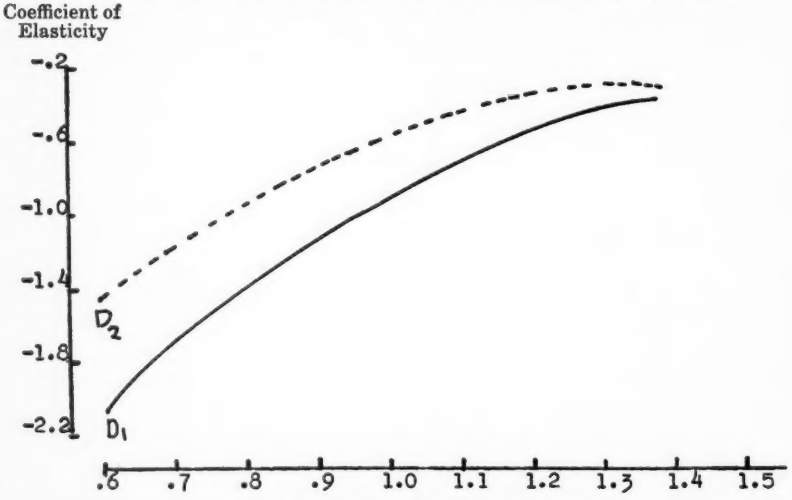
are obtained and substituted for the values in (D_1a). Table III lists production for 1924 as 1748 thousand tons and price as 3.176 cents. Using these values in (D_1a) to find the probable price in 1925 we find $y = 7.66178 - .000{,}002{,}281x$.

To get price from production in this equation, substitute production for 1925 (1934 thousand tons) for x and we obtain $y = 3.250$ cents as the probable price in 1925. The observed or actual price was 3.180 cents.

To get production from price, substituting values for x_0 and y_0 in (D_1b) it becomes $x = 3{,}355{,}000 - 438{,}000y$. Solving for x, probable production would be 1952 thousand tons in 1925. Thus, it appears evident that a rise or fall of 1 cent in price would increase or decrease production by 438 thousand tons in 1925. Both D_1 and D_2 are equally applicable in stating the law of demand for citrus fruits although D_1 is in simpler form. In each case the correlation coefficient D_1 (—0.80) and D_2 (—0.81) indicates that a high degree of inverse relationships

CHART IV

Elasticity of Demand Derived from the Two Demand Curves of Chart III



exist between the two variables. Price quantity relationships may be deduced by using either equation and solving for the unit in question. First and second degree demand curves are only valid within logical limits and may give absurb values at the extremities of the curve.

Since the law of demand for citrus fruits has been derived, it is now fitting to determine the coefficient of elasticity of demand. The definition for the coefficient is

$$n = \frac{dx}{x} / \frac{dy}{y} = \frac{dx}{dy} \cdot \frac{y}{x}$$

To derive the coefficient of elasticity of demand it is necessary to find $\frac{dx}{dy}$ of (D_1) or (D_2) and multiply the result by $\frac{y}{x}$.

Using (D_1)

$$n = \frac{dX}{dY} \cdot \frac{Y}{X} = n = -0.7957 \frac{Y}{X}$$

Using (D_2)

$$n = \frac{dX}{dY} \cdot \frac{Y}{X} = \frac{1}{3.0285 + 1.4310X} \frac{(Y)}{(X)}$$

From both D_1 and D_2 it may be seen that the coefficient of elasticity of demand varies from point to point on the demand curve. The coefficient varies even more depending upon the curve selected. The coefficient of elasticity will be deduced from (D_2) for different values of X. Both D_1 and D_2 (Chart IV) indicate a greater elasticity of demand for low production (high prices) and a lesser elasticity for high production (low prices).

In (D_2) when $X = 1$, when production does not change between two consecutive years, $n = -0.63$; that is, a 1.0 per cent reduction in the price of citrus will increase production by 0.63 per cent. When $X = 1.1$ there is a 10.0 per cent increase in production over the previous year, i.e., when production increase is normal[20] (the means of the link relatives are $\overline{X} = 1.1015$, $\overline{Y} = 1.028$) then $n = -0.61$.

[20]By normal is meant an average increase in production, i.e. per capita consumption, of 10 per cent over the previous year.

This means that a 1.0 per cent decrease in price will raise production by 0.61 per cent.

When X = 0.9, or production is off 10.0 per cent over the previous year, n = —0.81 per cent. In other words, a decrease in the price of 1.0 per cent will increase production by 0.81 per cent. The several elasticities obtained under varying conditions of production using D_1 and D_2 may be seen in Chart IV. Comparison of elasticities computed from first and second degree demand curves and derived by the several methods indicated in this study can be found in Table I. It must be observed from Chart IV that for all of these measures of increase or decrease in production, there appears to be an inelastic demand for citrus fruits.[21]

On examination of Table II it will be seen that different methods of deriving the demand curve give slightly different coefficients of elasticity of demand. In order to compare these elasticities, comparable points on the demand curve must be selected. Coefficients derived at points of normal change in both link relatives and trend ratios have shown only slight discrepancies. These slight differences can be accounted for by transformation of the units under consideration from one series into that of the other.

It will also be observed from Table II that those curves derived from data exhibiting the highest degree of correlation give the most reliable results in estimating the coefficient of elasticity of demand. Second degree curves, when indicating advantages in the coefficient of correlation, exhibit the same tendency toward a more reliable coefficient of elasticity. In general, those curves based on a closer relationship of the variables give the most authentic results.

[21]See footnote 14, p. 29.

CONCLUDING OBSERVATIONS

Table II summarizes the results obtained from deriving the law of demand for citrus fruit in six different ways. From four of these methods dealing with unadjusted and adjusted data, the value of the coefficient of elasticity of demand has been approximately —0.6 for normal (10 per cent increase in production and per capita consumption each year) conditions. Under these circumstances a reduction in price of citrus fruit of 1.0 per cent is associated with an increase in consumption of only 0.6 per cent. Even when there was considerable deviation from this normal, the coefficient was still less than 1.0. Thus, it may be concluded that the demand for citrus fruit is inelastic.

The price history of citrus fruit at the farm has been marked by severe fluctuations during the two decades under consideration. The evidence shows that citrus prices have varied inversely with citrus supplies generally. Further, prices appear to vary directly with consumer purchasing power. These two factors seem to account, at least partially, for high war-time production and prices.

From the results here obtained it is evident that further price studies might produce considerable marketing information of use both to the industry and the government.